National Aeronautics and Space Administration
Goddard Space Flight Center
Contract No. NAS-5-12487

T E C H N I C A L T R A N S L A T I O N S

by

DR. ANDRE L. BRICHANT

FIRST QUARTER - 1967

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ST - PF - LPS - 10552
25 pages

INVESTIGATION OF THE MAGNETIC FIELD FROM THE AMS "LUNA-10" [Zhuzgov, et al., Kosmicheskiye issledovaniya, 1966]

A report is given on the observations in the vicinity of the Moon of a structurewise regular magnetic field, of which the intensity during observation time varied within the limits from 24 to 40γ in accord with the variation of the magnetic activity index on the Earth's surface. The error in the absolute value of the scalar magnitude of the field is estimated by the quantity of $\pm 10\gamma$.

Comparison between the measured field values in the pericenter and apocenter regions and the estimate of possible field distortions by solar wind lead to the conclusion about the absence near the Moon of a field of dipole nature.

The question is discussed whether the observed field may be identified with the interplanetary field of solar origin, either deformed or trapped by the Moon and having finite conductivity and penetrability.

Comparison of measurements during fullmoon and newmoon periods failed to make directly apparent the extension of the Earth's magnetic field on the night side to distances of 60 Earth's radii.

ST - PF - CR - LPS - 10553
10 pages

STUDY OF CORPUSCULAR RADIATION ON SPACECRAFT "LUNA-10" [Grigorov, et al., Kosmicheskiye issledovaniya, 1966]

This paper presents the detailed measurement data on cosmic radiations registered aboard the first AMS "Luna-10". As such, this paper is an "in extenso" version of an earlier note [ST - LPS - PF - 10528] and also [ST - LPS - CR - 10526], where the description of the apparatus was given.

The intensity of primary cosmic radiation in interplanetary space is determined. The albedo for the primary radiation

relative to lunar surface has been measured in the orbit of the AMS. Data have been obtained on the fluxes of soft corpuscular radiation in the region of the tail of the Earth's magnetosphere, upholding the preliminary conclusions that have been previously communicated.

ST - AI - RA - 10554
9 pages

INVESTIGATION OF THE ATMOSPHERE BY RADIO-ASTRONOMICAL METHODS AT SMALL ANGLES ABOVE THE HORIZON [Stankevich, et al., Radiotekhnika i elektronika, 1967]

Theoretical and experimental investigations of the atmosphere's radioemission temperature have been conducted in the decimeter band for angles from $0^{o}30'$ to 10^{o}. Effective lengths are found for the absorption coefficient. Measurements of refraction attenuation of antenna amplification were also conducted. It was found that the latter takes place for angles $<2.5^{o}$ above the horizon, and increases as the altitude decreases. Thus, for an antenna with half-power level pattern near 40' at heights $0^{o}30'$ the amplification drops by 60%. It was shown also that at refraction attenuation of the amplification, the antenna scattering remains the same as for a uniform medium.

ST - PF - GM - 10555
5 pages

IRREGULAR VARIATIONS OF EARTH'S ROTATION VELOCITY AND ACTION OF SOLAR CORPUSCULAR STREAMS ON THE EARTH'S MAGNETOSPHERE [Afanas'yeva, Geomagnetizm i aeronomiya, 1966]

The author attempts to explain the irregular variations of the Earth's rotation velocity by action of solar corpuscular streams on the Earth's magnetosphere, in particular on its tail, by discussing the position of the magnetosphere tail for various geomagnetic conditions, and then referring to the daily observation data collected between 1961 and 1963. A conventional parameter is computed on the basis of these data, and it is found that its behavior in all the cases considered was of the same order, independently from the objectives of the current note. The main argument in favor of the hypothesis brought forth is the accounting for the noncoincidence in the direction of the magnetic field of the stream and of the geomagnetic field in the tail, which is characterized by a certain asymmetry due to universal geomagnetic anomalies.

ST - RAD - ACH - LPS - 10556
13 pages

INVESTIGATION OF X-RAY EMISSION OF THE MOON WITH THE HELP OF AMS "LUNA-10" [Mandel'shtam, et al., Kosmicheskiye issledovaniya, 1966]

The calculation is presented of fluorescent characteristics

of silicium, aluminum and magnesium lines in the composition of the surface layer of lunar rocks excited by X-ray radiation of the Sun. Description is given of the apparatus designed for the experimental detection of the Moon's X-ray emission and installed aboard AMS "Luna-10." The results of measurements are brought forth, in the course of which was dete ined the cosmic background level in the vicinity of the Moon, detecting at the same time the electrons with energy greater than 40 kev of the Earth's magnetosphere tail. The preliminary data on the registration of X-ray radiation are also given.

ST - PF - GM - 10557
4 pages

ON THE DISTRIBUTION OF ALFVÉN VELOCITY IN THE MAGNETOSPHERE [Van'yan, et al., Kosmicheskiye issledovaniya, 1967]

From a peculiarity in the distribution of Alfvén velocity in the magnetosphere the authors derive a series of consequences that are of importance for the understanding of the nature of geomagnetic micropulsations. The reasonings are based upon the data relative to the plasma jump, called "knee," of which a large number has been lately accumulated.

ST - IM - 10558
13 pages

INVESTIGATION OF METEORIC DUST WITH THE AID OF ROCKETS AND SATELLITES [Nazarova, Kosmicheskie issledovaniya, 1966]

The results are presented of meteoric dust investigation with the help of rockets and Earth's artificial satellites in the USSR for the period from 1957 to 1966. Measurements of spatial density of meteoric particles were conducted with the aid of piezoelectric sensors along flight trajectories of spacecrafts in the vicinity of the Earth, and also in the direction from the Earth's orbit toward and from the Sun.

ST - PR - 10559 - SP
4 pages

WHERE IS THE DANGER HIDDEN? APROPOS THE CAPE KENNEDY TRAGEDY [Marinin, USSR Press Circular, 1 February 1967]

This paper presents the comments of Yuriy Marinin concerning the catastrophe which occurred at Cape Kennedy on 27 January 1967.

→ ST - RA - RWP - 10560
12 pages

MEASUREMENTS OF KILOMETER COSMIC RADIOEMISSION IN INTERPLANETARY SPACE [Slysh, Kosmicheskiye issledovaniya, 1966]

Data have been obtained on the intensity of low-frequency radioemission in interplanetary space according to measurements

of that emission from interplanetary probes (AIS) Zond-2, Zond-3 and Venera-2 in the 20 to 2200 kc/sec frequency band.

The intensities measured in the frequencies of 985, 2000 and 2200 kc/sec are in agreement with the measurements of the galactic background performed by other authors.

In the 210 - 220 kc/sec band the spectrum increases steeply toward the side of low frequencies; the variation of intensity with distance, the observation of interference lobes and, possibly, that of occultation by the Moon, point to Jupiter as being an emission source, at least in the frequency of 200 kc/sec.

The occultation by the Moon took place in the presence of differential refraction in the upper ionosphere. In the very lowest frequencies of 20 and 30 kc/sec the observed radioemission may also be conditioned by the schrot effect of interplanetary electrons.

The radioemission spectrum of Jupiter in kilometer waves agrees well with Jupiter's spectrum of decameter radioemission.

ST - IM - 10561
4 pages

TEKTITY [Translation of the Introduction by E. L. Krinov, editor of the Russian version of the book, Tektites, by Dr. John O'Keefe, August 1965]

This paper presents the translation of the Introduction to the book, Tektites, by Dr. John A. O'Keefe, of Goddard Space Flight Center, written by E. L. Krinov.

ST - PR - LPS - 10562
4 pages

SUCCESS OF LUNA-13 . . . THE MOON IS NOT A DEAD HEAVENLY BODY [Ajoux, from the Belgian weekly, Pourquoi Pas?, 12 January 1967]

In performing with the help of Luna-13 a study of the lunar soil by radioactivity, Soviet scientists have realized an experiment henceforth classical on Earth, but which constitutes a prominent first in the Cosmos. It is generally considered that the data collected by this method will improve considerably the knowledge we n w have of the lunar crust.

TTC - AM - 10563
10 pages

PRACTICAL UTILIZATION OF DATA OF METEOROLOGICAL SATELLITES. . . TABLE OF CONTENTS and FIGURE CAPTIONS [Kondrat'yev, et al., book, Practical Utilization of Data of Meteorological Satellites, 1966]

This paper presents the Table of Contents and figure captions translated from the aforementioned book.

ST - GM - SP - 10564 STEADY GEOMAGNETIC MICROPULSATIONS AND

7 pages SOLAR CORPUSCULAR STREAMS [Bol'shakova, Geomagnetizm i aeronomiya, 1967]

A specific type of geomagnetic pulsation is juxtaposed with every type of solar corpuscular stream originating from the unperturbed regions of the Sun, from the active regions and from chromospheric flares.

On the basis of the study of morphological properties of these types of pulsations conclusions are derived about the different geometry of the streams inducing these pulsations and the variation of the radiation intensity level of these various types of streams in the solar activity cycle.

ST - IGA - PF - 10565
5 pages

POSSIBILITY OF DETERMINATION OF RELATIVISTIC PROTONS' CONTENT IN SOME SOURCES OF SYNCHROTRON RADIATION [Shklovskiy, Astronomicheskiy tsirkulyar No. 364, 29 March 1966]

The author proposes a new method allowing to determine, at least for certain sources, the content of relativistic protons and electrons.

The method is based upon the recently revealed "relict" radioemission filling the entire Metagalaxy. The generation of hard X-ray quanta (inverse Compton effect) is the result of interaction of relativistic electrons in the sources of synchroton radioemission with the "relict photons."

ST - CR - NP - 10566
6 pages

STUDY OF THE NUCLEAR CONPONENT OF PRIMARY COSMIC RAYS ABOARD AES "PROTON-2" [Volodichev, et al., Kosmicheskiye issledovaniya, 1967]

The results of measurements are described of the nuclear component of primary cosmic rays. These measurements have been carried out aboard AES Proton-2 with the aid of a Čerenkov spectrometer CEZ-1 during the 105 to 113 orbits of the satellite.

ST - IGA - NP - 10567
4 pages

RELICT RADIATION OF THE UNIVERSE AND POPULATION OF ROTATION LEVELS OF INTERSTELLAR MOLECULES [Shklovskiy, Astronomicheskiy tsirkulyar No. 364, 29 March 1966]

The author establishes that there is a foundation for the assertion that relict radiation of the Universe was discovered as early as a quarter of a century ago, but remained unintelligible till recently. In the current note the author discusses the influence of that radiation on the rotational temperature of interstellar molecules.

ST - AI - PF - 10568
7 pages

ON THE INFLUENCE OF CORPUSCULAR FLUXES AND OF ELECTRON PHOTOLOOSENING ON THE FORMATION OF THE D-LAYER OF THE IONOSPHERE [Bragin, et al., Kosmicheskiye issledovaniya, 1967]

Concentrations of electrons in the D-layer of the ionosphere are computed on the basis of data o direct measurements, pointing to a comparatively high and constant in time content of charged particles between the altitudes of 60 and 80 km.

The daytime increase of electron concentration in the lower ionosphere may be explained by the photoloosening reaction of electrons. The assumption is advanced that one of the principal ionizing agents sustaining a high degree of ionization in the 60 - 80 km altitude range in the course of a day are particles arriving from radiation belts.

ST - PF - GM - 10569
5 pages

ON THE MOTION OF A CHARGED PARTICLE IN THE UNIDIMENSIONAL MODEL OF MAGNETOSPHERE'S TRANSITIONAL LAYER [Samokhin, Kosmicheskiye issledovaniya, 1967]

The trajectory of a charged particle in a unidimensional model of the transitional layer of the magnetosphere is discussed in the light of specific hypotheses concerning the physical conditions in that layer, and as a function of the particle's angle of incidence upon it.

ST - AI - RWP - 10570
9 pages

STATE OF THE IONOSPHERE AFTER THE RESULTS OF SIGNAL OBSERVATIONS FROM AES "ELEKTRON-1" AND "ELEKTRON-3" [Mityakova, et al., Izv. Vysshikh Uch. Zavedeniy, 1967]

The results of observations are presented of phase difference of coherent frequencies of 20 and 30 Mc, carried out from AES Electron-1 and Electron-2 during the periods February - March and July - October 1964 in the city of Gor'kiy. The course of the total electron concentration was obtained

$$N_n^{\infty} = \int_0^{\infty} N dz$$

The minimum values $N_n^{\infty}(0.2 \div 0.3) \cdot 10^{13}$ el cm^{-2} are noted at nighttime, and the maximum values $N_{\infty}(1.3 \div 1.5) \cdot 10^{13}$ el cm^{-2} in the afternoon hours. The dependence is presented of the ionosphere's effective thickness on the time of the day. Two maxima of effective thickness of the ionosphere are observed, respectively at times of sunrise and sunset. Obtained also is the dependence of the dimensions of large-scale inhomogeneities and of the magnitude of relative variation of electron concentration $\Delta N_n/N_n$ on latitude and the time of the day.

ST - CM - 10571
8 pages

PERTURBATIONS OF AES ORBITS FROM TESSERAL HARMONICS OF GRAVITATIONAL POTENTIAL EXPANSION [Zhandarov, Kosmicheskiye issledovaniya, 1967]

A method is given for the determination of AES orbit perturbations from tesseral harmonics of the Earth's gravitational potential expansion, whereupon is utilized the intermediate orbit obtained by D. Brouwer.

ST - PP - 10572
4 pages

WAVE OF NONEQUILIBRIUM IONIZATION IN A GAS [Velikhov, et al., From the Fifth Symposium on Ionization Events in Gases, 1965]

As is well known, there is a nonlinear relationship between the current and the electric field in a gas.

In the fields below the "breakdown" level, gas may be in either current or currentless states. The boundary between these states may shift toward the side of the currentless state at the expense of any energy transfer mechanism. This process is analogous to the propagation of the flame front at slow combustion. The simplest situation is considered: the propagation of a plane ionization wave in a uniform electric field.

ST - PP - 10573
13 pages

IONIZATION INSTABILITY OF A PLASMA WITH HOT ELECTRONS [Velikhov, et al., From the Fifth Symposium on the Ionization of Gases, 1965]

This paper shows that it is possible to assert sufficiently specifically that the ionization instability is the number one problem for the utilization of a plasma with hot electrons.

A large amount of experimental work is required for the determination of realistic methods of ionization stabilization. Several such possible methods are suggested here, which, provided they are operational, will still impose hard requirements of flux homogeneity to make the instability possible.

Nor is excluded the possibility that one might have to put up with turbulent ionization, just as was done with turbulent flow of standard fluids. In this case the essential trait of turbulence phenomenon would apparently be the saturation of the Hall ratio and the corresponding rise of turbulent resistance to a current with a magnetic field.

ST - CR - 10574
5 pages

MEASUREMENT OF THE ENERGY SPECTRUM OF PRIMARY COSMIC RAYS IN THE ENERGY REGION FROM 10^{10} - 10^{14} EV WITH THE HELP OF AES "PROTON-1" [Grigorov, et al., Izv. A. N. SSSR, 1966]

This experiment, carried out aboard the heavy AES Proton-1, was designed to measure the energy spectrum of primary cosmic rays in the high energy range. So far this could not be performed by direct measurements.

The measurements were conducted with the aid of a type SEZ-14 ionization calorimeter. The results presented here cover only a part of the material collected during the satellite's lifetime and are therefore preliminary.

ST - CM - 10575
8 pages

ON THE EQUATIONS DESCRIBING THE ORBITAL PLANE'S ROTATION [Kopnin, Kosmicheskiye issledovaniya, 1967]

The general properties are investigated of equations utilized for describing the rotation of the orbital plane. Analogy is established between the equation describing the variation of the lateral angular deflection of the satellite from the fixed plane, and the equation for quasi linear oscillations of the mechanical system with one degree of freedom.

Certain characteristic peculiarities of spatial motion in the central field are illustrated on examples of isolated solutions.

ST - CR - 10576
6 pages

STUDY OF HIGH ENERGY γ-QUANTA BEYOND THE ATMOSPHERE [Grigorov, et al., Izv. A. N. SSSR, 1966]

The results of measurements are illustrated of primary cosmic radiation's γ-quanta, carried out from the space stations Proton-1 and Proton-2, designed for energies exceeding 50 Mev. The translated version includes the additional results published in a later work.

ST - AI - 10577
12 pages

EXPERIMENTAL INVESTIGATION OF THE EQUATORIAL IONOSPHERIC ANOMALY IN AFRICA IN THE PERIOD OF SOLAR MINIMUM [Vila, Annales de Géophysique, 1966]

The equatorial ionization anomaly in the F-region has been explored with the help of airborne soundings during March-April and June-July 1965, periods of solar activity minimum. These two periods correspond at longitude observed to opposed symmetrical effects of solar radiation. A three dimensional representation of the isolines f_0F_2 in latitude, local time and altitude makes apparent several characteristic regions: at the center, an equatorial plateau of high altitudes and low ionization, directed along a narrow ionization trough and propagating from South toward North; on the Northern and Southern edges of this plateau two crests of enhanced ionization, developing unequally in the course of the morning, and widening unevenly across subtropical zones. The warm crest, situated under the ecliptic

evolves slowly and attains a rather weak ionization maximum at about 1700 hours. The cold crest, which is the least exposed to solar radiation, becomes suddenly apparent at about noontime, forming a narrower and much denser tropical ionization maximum. Current theories are unable to provide a satisfactory explanation of this phenomenon. Photoelectron and atmospheric heating are suggested as mechanisms, likely to differentiate the magnetic tubes of force affected by the equatorial F-region anomaly.

ST - AP - AE - SPC - 10578
6 pages

INTENSITY VARIATIONS OF H_α AND [N II] 6 583 A LINES IN THE NIGHT SKY SPECTRUM [Dufay, et al., Comptes-Rendus de l'Académie des Sciences, 16 August 1961]

The strong intensity variations of the lines H_α and [N II] 6 583 A in the spectrum of the night sky are often the result of passage of galactic regions H II in the field of spectrographs. The line H_α, emitted in the interplanetary space or, more probably, in the upper atmosphere, can be isolated only outside the Milky Way.

ST - SA - 10579
6 pages

ELECTRON TEMPERATURE IN STELLAR SHELLS CONTAINING HIGH-ENERGY ELECTRONS [Guradyan, Doklady, 1967]

Attempt is made of determining the electron temperature in stellar shells with the assumption of emergence in the medium of free electrons by photoionization of hydrogen atoms and loss of their energy to recombination processes linked with hydrogen. The case of a bursting star is considered.

ST - PP - 10580
9 pages

ACCELERATION OF PLASMOIDS IN WAVEGUIDES BY A SUPERHIGH-FREQUENCY WAVE [Domrin, et al., Yadernaya fizika, 1967]

The acceleration is considered of an opaque plasmoid by an electromagnetic wave in a waveguide. The acceleration process is studied in detail for the case when the group velocity of the wave in the waveguide is much smaller than the speed of light in a vacuum.

ST - AI - NP - 10581
15 pages

CALCULATION OF CERTAIN CHARACTERISTICS OF EXTENDED AIR SHOWERS IN THE LOWER PART OF THE ATMOSPHERE FOR LARGE FLUCTUATIONS OF THE ELEMENTARY ACT [Nymmik, et al., Yadernaya fizika, 1967]

Certain characteristics of extended air showers (EAS) are

calculated in the assumption that the inelasticity coefficient and the multiplicity of particles produced in the interactions of protons with the nuclei of air atoms vary considerably from case to case.

The role of interactions with a large inelasticity coefficient in the development of EAS is considered. Results are given of calculations of energy distribution of primary protons generating EAS with a given number of particles and of energy flux in the electron-photon and the nuclear-interacting components of EAS.

ST - CR - 10582
6 pages

ANNUAL VARIATIONS OF COSMIC RAYS AND INTENSITY VARIATIONS OF COSMIC RADIATION AS A FUNCTION OF EARTH'S HELIOLATITUDE [Dorman, et al., Doklady, 1967]

This paper presents the results of unambiguous investigation of annual variations of cosmic rays by going at length over the material of the world network of cosmic ray stations and aerological sounding with concomitant reference to data relative to other geophysical events for the year 1960.

Analysis of the curves obtained shows that there is in the hard component a wave with a 12-month period, which does not exist in the neutron component. This is evidence that a great contribution is made to the seasonal variation of the hard component the annual variation of atmosphere temperature.

ST - NP - 10583
4 pages

DOUBLE CHARGE EXCHANGE OF 50 — 176 MEV π^--MESONS IN PHOTOEMULSION [Batisov, et al., Yadernaya fizika, 1967]

The total double charge-exchange cross-sections for π^--mesons on photoemulsion nuclei have been measured for eight energy values in the region 50 — 176 Mev.

ST - AI - PF - 10584

INTERRELATION BETWEEN THE IRREGULAR EVENTS IN THE IONOSPHERE OF THE AURORA ZONE AND THE DISTURBANCES IN THE OUTER RADIATION BELT [Gorbushina, et al., Geomagnetizm i aeronomiya, 1967]

The geographical disposition of the zone of irregular events in the lower ionosphere is compared with that of the outer radiation belt. The position of this zone was obtained coinciding with the position of the high-latitude boundary of the outer belt.

The displacement of the zone of ionospheric disturbances to the lower latitudes during magnetic disturbances coincides with the displacement of the boundary of the radiation belt.

The spatial and temporal characteristics of electron fluxes emerging from the belts coincide with the spatial and temporal characteristics of cases of irregular events in the lower ionosphere of the aurora zone.

ST - MSF - 10586
5 pages

FROM OUTER SPACE BY PARACHUTE! [Tereshkova, Aviatsiya i kosmonavtika, 1967]

Highlights are presented of an article by astronaut Valentina Nikolayeva-Tereshkova in response to readers of the above mentioned periodical.